Amendments to the claims (this listing replaces all prior versions):

1. (Currently amended) A method comprising:

determining integer factors of N, in which N represents the number of signals to be permuted;

selecting a configuration for layers of a permuting network based on the integer factors of *N* and on one or more pre-selected types of switches; and

constructing the permuting network in layers by using the one or more pre-selected types of switches based on the selected configuration, the constructing comprising

assigning multi-dimensional coordinates to the switches, each switch having a coordinate that is the same as another switch in the next layer, each layer except the last layer having at least two switches that have coordinates that are different from coordinates of switches in corresponding positions in the next layer.

2. (Original) The method of claim 1 in which each of the types of switches is capable of selecting one signal from among a number of signals, the number being different for different types of switches.

3. (Original) The method of claim 2 in which each of the integer factors corresponds to the number of signals that one type of switches can select from.

4. (Previously presented) The method of claim 1, further comprising selecting the set of prime integer factors w_1, w_2, ..., w_D (D being an integer) such that $N = w_1 \times w_2 \times \ldots \times w_D$.

5. (Original) The method of claim 4 in which the permuting network is configured to have $2D$-1 layers of switches, the switches including w_1:1, w_2:1, .., and w_D:1 switches or are constructed from w_1:1, w_2:1, .., and w_D:1 switches.

6. (Currently amended) A method comprising:

receiving *N* signals;

determining integer factors of *N*; and

constructing a permuting network using layers of switches having a configuration based on the integer factors of *N* and on one or more pre-selected types of switches, each layer has N switches of the same type, the constructing comprising

assigning multi-dimensional coordinates to the switches, each switch having a coordinate that is the same as another switch in the next layer, each layer except the last layer having at least two switches that have coordinates that are different from coordinates of switches in corresponding positions in the next layer;

re-ordering the *N* signals using the permuting network.

7. (Previously presented) The method of claim 6 in which each type of switch has a predefined number of input terminals and one output terminal.

8. (Original) The method of claim 7 in which each layer of the permuting network groups the *N* signals into subsets of signals and permutes the ordering of the subsets of signals, the number of signals in the subsets being equal to the number of input terminals that each switch in the layer has.

9. (Previously presented) The method of claim 7 in which each switch in a layer has a different coordinate, and constructing the permuting network comprises configuring the switches so that when a signal propagates from a first switch in one layer to a second switch in the next layer, the coordinates of the two switches differ in at most one dimension.

10. (Original) The method of claim 6 in which the integer factors are w_1, w_2, ..., w_D (D being an integer) such that $N = w_1 \times w_2 \times \ldots \times w_D$, and the pre-selected types of switches include w_1:1, w_2:1, ..., and w_D:1 switches.

11. (Currently amended) Apparatus comprising:

N input terminals, in which N is an integer, $N = w_1 \times w_2 \times \ldots \times w_D$, w_1, w_2, ..., w_D are integer factors of N, and at least two of w_1, w_2, ..., w_D are different from each other;

N output terminals; and

a permuting network to form non-blocking signal paths that connects the input terminals to the output terminals in an arbitrary order, the permuting network constructed from layers of switches that include w_1:1, w_2:1, ..., and w_D:1 switches or are constructed from w_1:1, w_2:1, .., and w_D:1 switches, each layer having the same number of switches of the same type;

wherein the permuting network is constructed by assigning multi-dimensional coordinates to the switches, each switch having a coordinate that is the same as another switch in the next layer, each layer except the last layer having at least two switches that have coordinates that are different from coordinates of switches in corresponding positions in the next layer, and configuring the switches so that when a signal propagates from a first switch in one layer to a second switch in the next layer, the coordinates of the two switches differ in at most one dimension.

12. (Original) The apparatus of claim 11 wherein each switch has input and output terminals, the input terminals of the switches in the first layer coupled to the N input terminals of the apparatus, the output terminals of the switches in the last layer coupled to the N output terminals of the apparatus, and for all layers except the last layer, the output terminals of the switches are connected to the input terminals of the switches in the next layer.

13. (Original) The apparatus of claim 12 in which the number of layers and the connection between switches of successive layers are based on a set of integer factors of N and on the types of switches used.

14. (Cancelled)

15. (Previously presented) The apparatus of claim 13 in which the permuting network is configured to have $2D$-1 layers of switches, each layer permuting the order of different subsets of signal paths.

16. (Original) The apparatus of claim 15 wherein for each p-th layer of switches, p ranging from 1 to D, w_p:1 switches are configured to form w_p-by-w_p permuters that are capable of permuting the ordering of w_p signal paths, and for each of the q-th layer of switches, q ranging from D+1 to $2D$-1, w_{2D-q}:1 switches are configured to form w_{2D-q}-by-w_{2D-q} permuters that are capable of permuting the ordering of w_{2D-q} signal paths.

17. (Original) The apparatus of claim 16 in which each of the input terminals of each permuter in the 2nd layer to the $(2D\text{-}1)^{th}$ layer is connected to the output terminal of a different permuter in the previous layer.

18. (Currently amended) Apparatus comprising:

a first active device pre-configured to generate N signals having a first ordering, in which N is an integer, $N = w_1 \times w_2 \times \ldots \times w_D$, w_1, w_2, …, w_D are integer factors of N, and at least two of w_1, w_2, …, w_D are different from each other;

a second active device pre-configured to accept the N signals arranged in a second ordering; and

a permuting network to receive the N signals having the first ordering and re-order the N signals so that the N signals have the second ordering acceptable by the second device, the

permuting network constructed from layers of switches that include w_1:1, w_2:1, ..., and w_D:1 switches or are constructed from w_1:1, w_2:1, .., and w_D:1 switches, each layer having the same number of switches of the same type.

19. (Original) The apparatus of claim 18 in which the number of layers and the connection between switches of successive layers are based on a set of integer factors of N and on the types of switches used.

20. (Original) The apparatus of claim 19 in which the second device is a memory.

21. (Original) The apparatus of claim 20 in which the first device is a computer motherboard.

22. (Cancelled)

23. (Currently amended) The apparatus of claim [[22]] 19 in which the permuting network is configured to have $2D$-1 layers of switches, each layer having N switches of the same type, each layer permuting the order of different subsets of the N signals.

24. (Currently amended) A computer program stored on a computer-readable media for causing a computer system to perform the functions of:

determining integer factors w_1, w_2, ..., and w_D of N such that $N = w_1 \times w_2 \times \ldots \times w_D$, N and D both being integers;

assigning a D-dimensional coordinate to each of a set of N signals;

in successive operations, changing the coordinates of the N signals for a particular dimension during each operation, such that no two signals have the same coordinates after each

operation, so that after the successive operations, the coordinates of the N signals match a set of target coordinates;

wherein for each operation, each signal prior to the operation has a coordinate that is the same as another signal after the operation [[,]] .

25. (Cancelled)

26. (Previously presented) The computer program of claim 24 in which the multi-dimensional coordinates are [x1, x2, ..., xD], xk ranging from 1 to wk for each k, k ranging from 1 to D.

27. (Original) The computer program of claim 26 in which the coordinates of the N signals are changed by swapping the coordinates of a pair of signals.

28. (Previously presented) Apparatus for re-ordering N signals, comprising:

$(2D - 1)$ layers of switches, D being an integer, the n-th layer and $(2D - n)$-th layer having w_n-by-w_n switches, n ranging from 1 to D, and w_1 to w_D being integer factors of N such that $N = w_1 \times w_2 \times \ldots \times w_D$, and at least two of $w_1, w_2, \ldots, w_D$ are different from each other, the first layer of switches re-ordering the order of N signals to generate a first set of re-ordered signals, the i-th layer of switches re-ordering the $(i\text{-}1)$-th set of re-ordered signals to generate an i-th set of re-ordered signals, i ranging from 2 to $2D$-1, the $(2D\text{-}1)$-th set of re-ordered signals matching a target ordering of N signals,

wherein each of N signals are assigned D-dimensional coordinates, the n-th coordinate ranging from 1 to w_n, the p-th layer switches configured to swap signals that differ only in the p-th coordinates with the coordinates in other dimensions being the same, p ranging from 1 to D, and the q-th layer switches configured to swap signals that differ only in the $(2D\text{-}q)$-th coordinates with the coordinates in other dimensions being the same, q ranging from D+1 to $2D$-1.

29. (Cancelled)

30. (Previously Presented) The computer program of claim 24, further comprising configuring switches in a permuting network based on the changes of coordinates in the successive operations.

31. (Previously Presented) The apparatus of claim 18 in which the permuting network comprises a field programmable logic array.

32. (New) A method of reordering N signals using $(2D\text{-}1)$ layers of switches, N and D both being integers, the method comprising:

determining integer factors w_1, w_2, ..., and w_D of N such that $N = w_1 \times w_2 \times \ldots \times w_D$;

assigning a D-dimensional coordinate to each of a set of N signals, the n-th coordinate ranging from 1 to w_n;

swapping, using the p-th layer switches, signals that differ only in the p-th coordinates with the coordinates in other dimensions being the same, p ranging from 1 to D; and

swapping, using the q-th layer switches, signals that differ only in the $(2D\text{-}q)$-th coordinates with the coordinates in other dimensions being the same, q ranging from $D+1$ to $2D\text{-}1$.